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1 8. The microfluidic device of Claim 7, wherein said analytical device
2 is a mass spectrometer.

1 10. The microfluidic device of Claim 9, wherein the tip of said
2 capillary comprising said sample interface means is tapered.

1 11. The microfluidic device of Claim 5, wherein said microfluidic
2 device further comprises a second elastic layer on top of said first elastic layer.

1 12. The microfluidic device of Claim 11, wherein said second elastic
2 layer comprises a pressure channel.

1 13. The microfluidic device of Claim 12, wherein said microfluidic
2 device further comprises a pump and valve system within said second elastic layer for
3 controlling the flow of fluid within said fluid flow channel.

1 14. The microfluidic device of Claim 13, wherein said sample interface
2 means comprises generating a mist using said pump system.

1 15. The microfluidic device of Claim 13 further comprising a sample
2 preparation chamber within said fluid flow channel.

1 16. The microfluidic device of Claim 15, wherein said sample
2 preparation chamber comprises a rotary fluid flow channel and a means for circulating a
3 fluid within said rotary fluid flow channel for conducting a chemical reaction, an assay, or
4 other sample preparations within said rotary fluid flow channel.

1 17. The microfluidic device of Claim 16, wherein said mean for
2 circulating the fluid within said rotary fluid flow channel comprises said pump and valve
3 system.

1 18. An analytical apparatus for analyzing a fluid sample comprising:
2 (a) an analytical device for analyzing the fluid sample; and
3 (b) a microfluidic device operatively interconnected to said analytical
4 device, wherein said microfluidic device comprises a first elastic layer comprising a fluid

5 flow channel and a means for introducing the fluid sample into said analytical device
6 from said fluid flow channel.

1 19. The analytical apparatus of Claim 18, wherein said analytical
2 device is selected from the group consisting of UV spectrometers, fluorescence
3 spectrometers, IR spectrometers, gas chromatography devices, LPLC devices, HPLC
4 devices, NMR devices, mass spectrometers and combinations thereof.

1 20. The analytical apparatus of Claim 19, wherein said analytical
2 device is an electrospray ionization mass spectrometer or a nanoelectrospray mass
3 spectrometer.

1 21. The analytical apparatus of Claim 20, wherein said fluid sample
2 introducing means comprises a means for generating an ionized mist from the fluid
3 sample.

1 22. The analytical apparatus of Claim 21, wherein said ionized mist
2 generating means comprises a capillary having a distal end and a proximal end, wherein
3 said proximal end of capillary is located within said fluid flow channel, and said distal
4 end of capillary is interconnected to a device for applying electrospray voltage for
5 generating the mist.

1 23. The analytical apparatus of Claim 22, wherein the bore diameter of
2 said distal end of capillary is about 100 μm or less.

1 24. The analytical apparatus of Claim 22, wherein said distal end of
2 capillary is tapered.

1 25. The analytical apparatus of Claim 18, wherein said microfluidic
2 device further comprises a second elastic layer on top of said first elastic layer.

1 26. The analytical apparatus of Claim 25, wherein said second elastic
2 layer comprises a pressure channel for controlling the flow of fluid through said fluid
3 flow channel.

3 spectrometers, gas chromatographic devices, liquid chromatographic devices, NMR
4 devices, mass spectrometers and combinations thereof.

1 41. The method of Claim 40, said analytical device is a mass
2 spectrometer.

1 42. The method of Claim 41, wherein said sample providing means
2 comprises generating an ionized mist from said fluid sample.

1 43. The method of Claim 42, wherein said ionized mist generating step
2 comprises applying electrospray voltage to said distal end of capillary using an
3 electrospray voltage device to generate said ionized mist.

1 44. The method of Claim 43, wherein the tip of said distal end of
2 capillary is tapered.

1 45. The method of Claim 37, wherein said first elastic layer of
2 microfluidic device further comprises a sample preparation chamber which is integrated
3 with said fluid flow channel.

1 46. The method of Claim 45, wherein said microfluidic device further
2 comprises a second elastic layer on top of said first elastic layer.

1 47. The method of Claim 46, wherein said second elastic layer
2 comprises a pressure channel.

1 48. The method of Claim 47, wherein said microfluidic device further
2 comprises a pump and valve system within said second elastic layer for controlling the
3 flow of fluid within said fluid flow channel.

1 49. The method of Claim 48, wherein said sample preparation chamber
2 comprises a rotary fluid flow channel and a means for circulating a fluid within said
3 rotary fluid flow channel.

1 50. The method of Claim 49, wherein said mean for circulating the
2 fluid within said rotary fluid flow channel comprises said pump and valve system.

1 51. The method of Claim 50 further comprising the steps of preparing
2 said fluid sample within said sample preparation chamber.

1 52. The method of Claim 45, wherein said sample preparation step
2 comprises conducting a sample preparation process within said sample preparation
3 chamber, wherein said sample preparation process comprises:

- 4 (i) conducting a chemical reaction;
- 5 (ii) conducting an assay;
- 6 (iii) degrading a peptide or protein;
- 7 (iv) conducting a chemical analysis;
- 8 (v) extraction of analytes from solvents;
- 9 (vi) extraction of analytes from bodily fluids;
- 10 (vii) concentration of sample analytes;
- 11 (viii) affinity purification of an analyte;
- 12 (ix) digesting a nucleic acid, carbohydrate, lipid or other molecule or
13 mixture of molecules;
- 14 (x) separation; and
- 15 (xi) cell growth (mammalian, bacterial or parasite).

1 53. The method of Claim 52, wherein said sample preparation step
2 comprises conducting a combinatorial chemistry for preparation of an array of polymers
3 from a monomer.

1 54. The method of Claim 53, wherein said monomer is selected from
2 the group consisting of nucleotides, amino acid peptides, carbohydrates, lipids, and
3 precursors for combinatorial synthesis.

1 55. The method of Claim 52, wherein said sample preparation step
2 comprises conducting a receptor or an enzyme binding assay.

1 56. The method of Claim 52, wherein said sample preparation step
2 comprises conducting binding of a target molecule to an array of oligonucleotides,
3 peptides, proteins, oligosaccharides, and small molecules.

